

CLAIMS

1. A tandem printer with a mechanism for fine substrate-position correction, comprising:
 - 5 a first printing station;
 - a second printing station;
 - a rotatable element, rotating at a given rotation rate, that receives the substrate after printing thereon by the first printing station and transfers the substrate toward the second printing station;
 - 10 a sensor which measures the position of an edge of the substrate during its transfer from the first printing station to the second printing station; and
 - 15 a controller, which applies a corrective step change in angular position of the rotatable element responsive to the measurements of the sensor, without changing the general rotation rate of the rotatable element.
- 15 2. A tandem printer according to claim 1 wherein the sensor which measures the position of an edge of the substrate is situated on the rotatable element.
3. A tandem printer according to claim 1 wherein the sensor which measures the position of an edge of the substrate is adjacent to the rotatable element.
- 20 4. A tandem printer according to any of claims 1-3 and comprising:
 - sub 2 > a transfer system which transfers the substrate from the first printing station to the second printing station, in which the rotatable element is comprised;
 - the transfer system further comprising:
 - 25 a flexible strip, travelling at a given rate and providing motion to the rotatable element, wherein a corrective step displacement of the flexible strip induces the corrective step change in angular position of the rotatable element.
- 30 5. A tandem printer according to claim 4 wherein the flexible strip rotates at a constant rate.
- sub 3 > 6. A tandem printer according to claim 4 or claim 5 wherein the flexible strip is a timing belt.

7. A tandem printer according to any of claims 4-6 and comprising at least one pulley that provides the corrective step displacement of the flexible strip.

8. A tandem printer according to claim 7, wherein the at least one pulley comprises:
5 two pulleys, situated along the flexible strip, one upstream and one downstream of the rotatable element, said pulleys pressing into the flexible strip at a first point and a second point, respectively, wherein when pressure of one pulley is partially released, the other pulley takes up the thus produced slack, providing the corrective step displacement of the flexible strip.

10 9. A tandem printer according to claim 8 and comprising:
a rod, comprising two points, to which the two pulleys are attached, one at each edge,
wherein linear movement of the rod provides the motion of the pulleys into and away
from the flexible strip.

15 10. A tandem printer according to claim 9 and including a motion provider for the rod,
comprising:
an eccentric shaft to which the rod is attached; and
a motor which provides motion to the eccentric shaft,
wherein the motor is activated by the controller.

20 11. A tandem printer according to claim 9 and including a motion provider for the rod,
comprising:
a slider-crank mechanism, wherein the rod is attached to the slider and moves in the
same direction as the slider; and
25 a motor which provides motion to the slider-crank mechanism,
wherein the motor is activated by the controller.

12. A tandem printer according to claim 9 and including a motion provider for the rod,
comprising:
30 a piston-cylinder mechanism, wherein the rod is attached to the piston and moves in the
same direction as the piston; and
a motor which provides motion to the piston-cylinder mechanism,
wherein the motor is activated by the controller.

13. A tandem printer according to claim 9 and including a motion provider for the rod, comprising:

a turning-screw mechanism, wherein the rod is attached to the screw and moves in the same direction as the screw; and

5 a motor which provides motion to the turning-screw mechanism, wherein the motor is activated by the controller.

14. A tandem printer according to claims 10-13 wherein the motor is a stepper motor.

10 15. A tandem printer according to claim 8 and comprising:

a shaft on which one of the two pulleys is mounted, pressing against the flexible strip at a first point; and

flexible strip at a second point,

15 wherein linear movement of the shaft provides motion of the pulley at the first point, and the response of the resilient device to release or demand in slack provides motion of the pulley at the second point.

16. A tandem printer according to claim 15, wherein the shaft is an eccentric shaft and 20 including:

a motor which provides motion to the eccentric shaft, wherein the motor is activated by the controller.

17. A tandem printer according to claim 15 and including a motion provider for the shaft, 25 comprising:

a slider-crank mechanism, wherein the shaft is connected to the slider and moves in the same direction as the slider; and

a motor which provides motion to the slider-crank mechanism, wherein the motor is activated by the controller.

30 18. A tandem printer according to claim 15 and including a motion provider for the shaft, comprising:

a piston-cylinder mechanism, wherein the shaft is connected to the piston and moves in the same direction as the piston; and

a motor which provides motion to the piston-cylinder mechanism, wherein the motor is activated by the controller.

19. A tandem printer according to claim 15 and including a motion provider for the shaft, 5 comprising:

a turning-screw mechanism, wherein the shaft is connected to the screw and moves in the same direction as the screw; and

a motor which provides motion to the turning-screw mechanism, wherein the motor is activated by the controller.

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20. A tandem printer according to claims 16-19 wherein the motor is a stepper motor.

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q4* 21. A tandem printer according to any of claims 8-19 wherein the two pulleys are 15 substantially identical.

22. A tandem printer according to any of claims 8-21, wherein the section of the flexible strip adjacent to the first point and a section of the flexible strip adjacent to the second point are parallel to each other.

20 23. A tandem printer according to any of claims 1-22, wherein the tandem printer comprises 25 a duplex printer for printing on both sides of the paper while inverting it.

24. A tandem printer according to any of claims 1-22, wherein the tandem printer comprises a multicolour printer of single-side printing, with each colour being printed with a different one 25 of the tandem series of printing engines.

25. A tandem printer according to any of claims 1-24, wherein the tandem printer is a conventional printer which uses plates.

30 26. A tandem printer according to any of claims 1-24, wherein the tandem printer is an electrostatic printer.

27. A tandem printer according to any of claims 1-24, wherein the tandem printer is an electronic printer.

28. A tandem printer according to any of claims 1-27, wherein the tandem printer is a lithographic printer.

5 29. A multi-engine printer with a mechanism for fine substrate-position correction, comprising at least 3 printing engines, wherein each adjacent pair of printing engines comprises a first printing station and a second printing station, in accordance with claims 1-28.

10 30. A method of applying a fine positional correction to a substrate on a tandem printer, comprising:

printing on a substrate by a first printing station;

transferring the substrate from the first printing station toward a second printing station, comprising:

15 mounting the substrate on a rotatable element of a substrate-transfer system; and

moving the substrate by rotating the rotatable element at a given rotation rate;

measuring the angular position of an edge of the substrate on the rotatable element; and

applying a step angular displacement to the rotatable element, responsive to the measurement, without changing the rotation rate of the rotatable element.

20 31. A method according to claim 30 wherein:

rotating the rotatable element at a given rotation rate comprises rotating the rotatable element by a flexible strip; and

applying the step angular displacement to the rotatable element comprises applying a step displacement to the flexible strip.

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32. A method according to claim 31 wherein applying the step displacement to the flexible strip comprises any of a positive and negative step displacements to the flexible strip, thus inducing any of a clockwise and a counterclockwise step angular displacements to the rotatable element.

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33. A method according to claim 32 wherein:

applying the positive step displacement to the flexible strip comprises:

releasing flexible strip slack upstream of the rotatable element; and

taking up flexible strip slack downstream of the rotatable element; and

applying the negative step displacement to the flexible strip comprises:
releasing flexible strip slack downstream of the rotatable element; and
taking up flexible strip slack upstream of the rotatable element.

5 34. A method according to claim 33 and including using a lookup table to calculate a necessary step displacement of the flexible strip in order to achieve a desired step angular displacement of the rotatable element.

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35. 35. A method according to any of claims 31-34 wherein the flexible strip is driven by a driving pulley, rotating at a constant rotation rate.

36. A method according to any of claims 31-34 wherein the flexible strip is a timing belt.